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ABSTRACT

This paper reports on a continuation of a previous investigation of social and economic inequalities among suburban school districts, points out some of the measurement problems encountered while engaged in this task, and summarizes some literature in economics and sociology that relates to this topic. The empirical research tested three hypotheses: school districts in at least some metropolitan areas are becoming less alike regard to their stock of human resources; school districts in at least some metropolitan areas are becoming more alike with regard to certain fiscal characteristics such as per pupil expenditures, property valuations, and tax effort; and the expenditure levels of school districts in at least some metropolitan areas are becoming increasingly determined by the material and human resources found in those districts. The first hypothesis is not strongly supported, with the possible exception of the income measurement. The second hypothesis is strongly supported, though the movement toward equality may have been more a phenomenon of the 1950's than of the 1960's. The third hypothesis is also strongly supported. The paper includes conclusions, tables of data, references, and appendixes that define terms and deal with statistical complexities. (Author/IRT)

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SOCIAL AND ECONOMIC INEQUALITIES AMONG SUBURBAN SCHOOL DISTRICTS:
Observations from a Two-Decade Study

A paper presented to the 1974 Annual Meeting of the
American Educational Research Association, Chicago, Illinois

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PURPOSES

This paper has three purposes. The first purpose is to report a continuation of our investigations of social and economic inequalities among suburban school districts. We have previously published results dealing with the decade of the 1950's (Hickrod and Sabulao, 1969a, 1969b), and we have now extended this analysis to the 1960's. Our second purpose is to point out some of the measurement problems we have encountered while engaged in this task. With some compassion for the general readers, we have pursued at least a portion of this second purpose in a technical appendix prepared for this paper. Thirdly, we have tried to briefly summarize some literature in both the fields of economics and sociology which relate to this topic. Thus our intent is not only to report the results of a limited amount of new empirical research, but also to comment on research problems in this whole area of socio-economic disparities among suburban school districts.

PRIOR RESEARCH

An appropriate starting point in the economic literature is the year 1961. In that year Burkhead outlined an hypothesis of increasing fiscal homogeneity among units of metropolitan

government. Burkhead expressed his hypothesis thusly:

"Processes of economic development within the metropolitan area are accompanied by an increased homogeneity in patterns of governmental expenditures and in the distribution of taxable resources" (Burkhead, 1961, p. 338). If we focus only upon Burkhead's school finance data for seventeen city school districts and fifteen local and exempted school districts in the Cleveland metropolitan area we find the following to be the facts. For expenditure per ADM (average daily membership) there was a strong decrease in variation between 1940 and 1950, and then a slight increase in variation between 1950 and 1956. The overall sixteen-year period studied by Burkhead shows a trend toward increasing expenditure equality among school districts. Furthermore, the sixteen-year period also shows a trend toward increasing tax effort equality. The crucial wealth variation, defined in terms of per pupil assessed valuations was, unfortunately, given only for the period 1950 through 1956. As Riew (1961) pointed out in a note on Burkhead's research, the variation actually increased slightly at least on one of the measurements of valuation used. For the other wealth measurement there is very little change.

Following close on Burkhead's publication were the Curran (1963) results. The Curran research is based on the longest time series one is apt to find. Although the measurements are only for nineteen school districts within Milwaukee county, variation was measured for eleven points in time

between 1925 and 1960. Curran found that the per capita expenditure variation is very erratic, but in general, it tends to increase up to 1950 and then to decrease thereafter. The school tax rates also show a trend toward increasing equality, rather strikingly so from 1940 to 1960. With regard to per capita property valuation, the variation tends to increase from 1920 to 1950 and then to decrease from 1950 to 1960, ending up at the end of the forty-year period about where it was at the beginning of this period. These early results thus supported Burkhead at least with respect to the expenditure and tax effort variables. However, as Netzer (1966) pointed out, conflicting evidence was also to be found, and furthermore, support for increasing wealth equality was very weak at best.

The urban public finance literature that has come to our attention in more recent years does not seem to follow directly from the Burkhead hypothesis. It does relate, of course, to the broader matter of economic differentiation in metropolitan areas and therefore we wish to briefly mention it. For example, Boelaert (1970) provides one with a good demonstration of the effect of governmental consolidation upon inequality in tax capacity within a metropolitan area. Perhaps more interesting are Murray's studies (1969, 1970, 1971) of the distribution of income among families in a number of metropolitan areas. Utilizing the Gini Coefficient Murray demonstrates greater inequalities in the family income distribution in 1960 than in 1950. Murray's work also suggests some structural relationships

that might be expected in urban economies. For example, family income inequality appears to be negatively related to income level and positively related to the non-white representation. Frech and Burns (1971), using a different research design, have been able to support these same relationships.

Turning now to the sociological literature, we find that in the late 1950's and early 1960's sociologists had already begun to warn us that the suburbanization process in the United States was resulting in communities that were quite different in socio-economic terms (Berger, 1960; Duncan and Duncan, 1955). More importantly, at least some sociologists have been willing to speculate that not only were suburbs different in socio-economic terms when viewed at one point in time, but that there might be a general socio-economic segregation process under way which would result in increasing residential segregation among socio-economic classes in the United States (Boskoff, 1962; Smith, 1970). Simultaneously, sociologist and educator, Robert J. Havighurst, was reasoning that if this process was going on within the suburban population, then it must also apply to suburban school districts (Havighurst, 1961; 1966). This theme of suburban differentiation and its educational implications has since been expanded by Havighurst and Levine (1971).

We have had some trouble, however, locating sociological empirical research which directly tests these suburban differentiation notions within a longitudinal framework. There is a

study by Lazerwitz (1960) using a concentric zone approach which did find evidence of increasing socio-economic heterogeneity in a number of metropolitan areas between 1950 and 1956. More revealing is a study by Schnore and Pinkerton (1966) which found an increasing educational disparity between the central city and its suburban ring during the decade of the 1950's. Much of the current sociological empirical work, however, seems to be focused upon exploring the alleged social status superiority of the suburban ring over the central city rather than in exploring social status differentiation within that suburban ring. These two social processes may be connected, however. For example, from the work of Schnore (1967) and Smith (1970) we know that the older and larger metropolitan areas are the ones which show the greatest social status differentiation between the ring and the central city. We also know that when the central city has a high manufacturing ratio and a low annexation history, the social status differential between the ring and the city will be high. It is at least possible that these determinants of ring-central city differentials are also the determinants of variation within the suburban ring itself. That is, the younger and smaller metropolitan areas with central cities showing low manufacturing profiles and strong annexation movements are also those in which one will find less suburban variation, either among municipalities or among school districts.

The educational literature differs from the economic and sociological literature in at least two respects. First, most educational research is conducted in terms of school districts rather than municipalities (which the economists tend to prefer) or census units (which the sociologists tend to prefer). Secondly, the educational literature tends to emphasize the implications of this metropolitan social and economic disparity for educational administrative decisions, and for public policy debate purposes. The lion's share of the educational literature relates to school finance, and we shall restrict our coverage in this paper to that particular section of administrative research literature.

Although it is certainly possible to go back to an earlier date, we will start with 1967 in the school finance literature. In that year Hickrod (1967a) investigated disparities among the seventy-nine school districts of the Boston SMSA between 1950 and 1960. In addition to the conventional school finance variables of property valuations, expenditure, and fiscal effort, measurements of human resources such as the percentage of college educated, the occupational composition of the school district, and the median family income of the families and unrelated individuals were added to his research design. Using an application of the Gini index support was given to Burkhead's hypothesis of increasing fiscal homogeneity among school districts in metropolitan areas. The evidence relating to human resource inequalities was not so clear.

Hickrod also used a sector analysis procedure to demonstrate the appearance in 1960 of an affluent sector of contiguous school districts in the Boston SMSA. This affluent sector was much more apparent in 1960 than it had been in 1950.

In 1969 Hickrod and Sabulao expanded the original Boston research design to include data from four other metropolitan areas, e.g., St. Louis, Chicago, Cleveland, and Detroit. They maintained the same time span, e.g., 1950 to 1960. The technique selected to measure disparity was a "t test" based on the correlated variances. Using this inferential statistical approach the researchers were able to support the notion of increasing human resource heterogeneity and pointed especially to the growth of income inequality between school districts between 1950 and 1960 in all five metropolitan areas. By contrast, Burkhead's hypothesis of increasing fiscal homogeneity did not receive much support.

Lows and Others (1970) have also used this "t test" approach to explore the Burkhead hypothesis in the Chicago metropolitan area. Lows used two different specifications of the Chicago metropolitan area. An "established" metropolitan area consisting of thirty-six high schools was explored and also a larger "emerging" metropolitan area consisting of forty-four high schools was utilized. If one is willing to drop the requirement of statistical significance and look only at the general trends, then the following facts can be observed from the Lows data for the period 1955 to 1965. For expenditures

per pupil there is a trend toward greater equality and for educational tax rate there is also a trend toward greater equality. However, Lows stresses the fact that for property valuation per pupil, the trend is in the other direction; e.g., increasing inequality.

Two other pieces of metropolitan school finance research should be mentioned, although they are not directly in the tradition of testing hypotheses relating to increasing or decreasing socio-economic variance. One of the most extensive studies of variation among school districts with regard to their fiscal characteristics done in recent years is the National Educational Finance Projects special project conducted by Rossmiller, Hale and Frohreich (1970). Among its many findings the NEFP study does report the results of a discriminant function analysis done on seventy school districts equally divided between "established" suburbs and "developing" suburbs. To the extent that the reported multivariate F ratios decrease in magnitude between 1962 and 1967, the hypothesis of increasing fiscal homogeneity would be supported. A close inspection of the NEFP data will reveal that these ratios did indeed fall for revenues and expenditures, but not for fiscal capacity. Furthermore, inspection of the standardized discriminant function coefficients suggests that an increasing disparity in fiscal capacity between these classes of suburbs may be more a matter of income than of property valuations. Since no less than forty of these seventy suburban schools come from a single state,

New York, one might be hesitant to generalize the results of this particular small aspect of a much larger study.

Baron's study (1971) of expenditure disparities among schools in the Chicago metropolitan area between 1961 and 1966 is interesting in several respects. It is unusual to see a comparison of disparities among individual schools (attendance centers) within the central city contrasted with disparities among suburban school districts. Baron demonstrated that the suburban expenditure variation between high and low social status schools exceeds the variation between high and low social status schools within the central city. Within the central city, expenditure variation actually shrunk over the five-year period due at least partially to the effects of NEA Title I aid. However, expenditure variation increased among suburban elementary schools in Cook county, Illinois, during this same period.

We mentioned earlier that the educational researcher is also interested in the impact of these socio-economic differentials. This can be illustrated with regard to local district educational expenditure levels. There has been an abundance of studies in both the school finance literature and the economics literature concerning the determinants of local district expenditure levels. Mincer (1971) has reviewed many of these studies for the period 1950 through 1969 using a "local demand" frame of reference. Virtually without exception both the property valuations of a district and some measures of human

resources such as income, educational level, etc., have been found to be good predictors of expenditure per pupil. This type of cross-sectional finding does not stir much curiosity in and of itself. However, at least two of these studies (Hickrod and Sabulao, 1969; Potter, 1966) also suggested that the prediction power of local resources might be rising with the passage of time.

This suggestion of increasing determination of local expenditure levels by local resources is of particular importance in the light of recent legal developments in school finance. In a large number of cases (NOLPE, 1972), first in the federal courts, and now in the state courts, school finance reform forces have tried to establish what has come to be known as the principle of "fiscal neutrality" or sometimes simply the "Serrano" principle, after the leading case in this area. While the United States Supreme Court did slow somewhat this drive to establish "fiscal neutrality" with its Rodriguez v. San Antonio decision, there is no doubt that for many educators and policy makers it remains an important goal. A number of state and national studies have made this very clear (Alexander, Jordan and Others, 1973; Benson, 1974; Benson and Others, 1972; Garms, Kirst and Others, 1973; Hickrod and Others, 1973). The fiscal neutrality principle is usually stated in negative terms; that is, "the quality of a child's education should not be a function of the wealth of the district in which he and his family happen to reside," or some similar

wording. We have argued elsewhere that the best means of measuring fiscal neutrality is by an application of the Gini Coefficient and its associated Lorenz curve (Hickrod, Chaudhari and Tchong, 1972; Hickrod, 1973; Hickrod, 1974), and we have applied this statistical technique to time series data in Illinois (Hickrod and Chaudhari, 1973). Other researchers have also used the Gini Coefficient in their research efforts in school finance (Barkin, 1967; Grubb and Michelson, 1973; Harrison and McLoone, 1965; Michelson, 1972; Wilensky, 1970). However, a less efficient means of measuring fiscal neutrality consists of either the simple Pearson correlation coefficient between wealth and expenditures, or a multiple correlation between local expenditures and various measurements of district resources. The higher the correlations, the lower the fiscal neutrality. Using this "second best" approach to fiscal neutrality, one can then observe the strength of these relationships through time and arrive at some notion of progress toward, or movement away from, this policy goal.

MAJOR HYPOTHESES AND THEIR RATIONALE

From the type of literature indicated above we have drawn three hypotheses relating to metropolitan suburban school districts:

- H1: School districts in at least some metropolitan areas are becoming less alike with regard to their stock of human resources. The stock of human resources can be defined as the proportion of well-educated adults possessing advanced occupational skills, and capable of earning high income, who reside within the geographic limits of the school district.
- H2: School districts in at least some metropolitan areas are becoming more alike with regard to certain fiscal characteristics such as per pupil expenditures, property valuations and tax effort.
- H3: The expenditure levels of school districts in at least some metropolitan areas are becoming increasingly determined by the material and human resources found in those districts.

A rationale can be stated for each hypothesis. For example, the first hypothesis concerning increasing socio-economic residential segregation might be at least partially explained by the gradual disappearance of other visible symbols of social status. The utility of a "good address" does remain after the taste for fine wines, imported cars, good books, etc., have become the possessions of those lower in the social scale. In fact, the current gasoline shortage may force the retirement of luxury automobiles, fast boats, flashy snowmobiles, and sporty dune buggys. The result may be that the residence may become an even more important symbol of social success. Residential segregation may also be a thinly concealed means of racial and ethnic discrimination. Perhaps Archie Bunker has made the more obvious forms of discrimination socially unacceptable but all men, so it is alleged, have the right to "live where they want to live" as long, that is, as they can afford it. The fact that

this last clause assures that rich will live with rich, poor with poor, and whites with whites, is not really lost on anyone. Residential socio-economic segregation also coincides with the realities of the housing market. Experimental communities excluded, \$75,000 homes are not normally found next to \$25,000 homes. Residential segregation may also spring from the desire to move into "good communities" in order to pass on unearned advantages to one's children. Many a liberal, including the academic variety, is willing to live in an achieved status society himself or herself, but there is a noticeable movement toward an ascribed status society when thoughts turn toward their own children. An hypothesis of increasing socio-economic residential segregation is more than plausible.

The scenario for the second hypothesis is also not difficult to construct. Increasingly equal expenditure levels might be explained on a number of bases. For example, the effects of collective negotiations may be to narrow expenditure levels. Word of salary settlements travels quickly in metropolitan areas. Tightening state certification standards and state mandated salary scales may also play a role here. There is also the growing militancy of formerly underprivileged groups, including many semi-rural constituencies. Expenditure differentials that would have been tolerated in silence decades ago are no longer acceptable to an increasingly egalitarian oriented society. Suburbanization has also raised the costs of former rural areas around the city until they are more like the

urbanized portions of the metropolitan area. General inflationary movements may also have leveled expenditures among school districts. The decentralization of business and industry from the central city and the establishment of shopping centers and industrial parks may all have contributed to a leveling of property valuations per pupil. As the costs of urban living and attendant public services became more evenly spread in the metropolitan areas, the tax effort to support these public services may also have become more alike. An escape to the suburbs to avoid the high taxes of the central city long ago became impossible unless one wanted to spend most of his or her life in a car commuting long distances. Those few who did choose the "exurban" commuting may now also be casualties of the energy shortage.

We grant that a rationale for the third hypothesis is not so easy to construct. The failure of state grant-in-aid policies, that is, the so-called "equalization" formulas to effectively break the connection between local wealth and local expenditures has been widely proclaimed by John Coons and Others (1970). No doubt this is a part of the picture, but there must be something else here of greater magnitude than simply the failure of state equalization policies. If the third hypothesis is clearly sustained by other researchers it will provide support for the more radical critics of public education in the United States who believe that the public educational system provides more of a means of maintaining social stratification

than of increasing social mobility (Carnoy, 1972). In the 20-20 of hindsight an increasing determination of local expenditure levels by local resources throughout the fifties and the sixties would do much to explain the high levels of judicial activity at the end of that period. That is, the massive amount of school finance litigation could then be viewed as a response to a social problem that was slowly becoming more malignant in the body politic with the passage of time. Legislative treatments were not helping, and the more drastic surgery of the courts was therefore the only logical step.

SAMPLING AND MEASUREMENT PROBLEMS

As Lows (1970) has pointed out, individual research efforts in this area differ greatly on four "dimensions"; that is, the population or sample, variables selected, the points in time established for the longitudinal study, and last but not least, the statistical procedures used to measure disparity or inequality. We have reluctantly come to the conclusion that most of the studies of metropolitan school differentiation, including our own, are not really samples of any larger population. They are, rather, small populations measured at different points in time. We have therefore abandoned our earlier attempts to apply inferential statistical tests to these data (Hickrod and Sabulao, 1969a, 1969b). This decision forces us back to simple descriptive statistics, but we think we are now on sounder grounds than by making somewhat doubtful assumptions

about a hypothetical population from which the metropolitan measurements might be drawn.

Definition of the population is further complicated by lack of agreement over the term "suburban." As Hadden (1969) indicates, most of the research definitions are very "ad hoc." This is a particularly troublesome matter since the definition of "suburban" establishes the distribution upon which the statistical computations will take place and therefore different definitions of "suburban" will result in different parameters. In fact, differences among reported research efforts may be largely a matter of how different researchers defined their suburban population. For example, in our studies, "suburban school districts" are defined as all school districts in a given standard metropolitan statistical area which were tracted by the Bureau of the Census in its 1950 census of population. We deliberately dropped the central city from the distribution. This results in a small number of districts in each population; specifically, twenty-eight for Chicago, twenty-nine for Cleveland, twenty-three for Detroit, and twenty-three for St. Louis. Therefore in these four metropolitan areas we are really only studying the "near" suburbs. However, in the Boston SMSA, that same ad hoc definition allowed us to study seventy-two districts and to move out geographically quite some distance from the central city school district. Lows (1970) addressed himself to this problem in using both an "established" and an "emerging" metropolitan area.

Lest it be thought that a simple solution to this problem is to define "suburban" as some constant number of miles from the central city school district, say fifty miles, we would point out that data over a twenty-year period, or even over a ten-year period, will rarely be available on all the school districts so defined.

The selection of variables upon which to measure disparity or inequality is also a problem. The strong economic derivation of our hypotheses dictated at least three central fiscal concepts, that is, "expenditure," "fiscal effort," and either "taxpaying ability" or the broader concept of "wealth." But, of course, there are many operational specifications of each of these concepts. For example, some researchers will prefer per pupil measurements and some will prefer per capita measurements and the results will differ with each operational specification. The problem is, if anything, more complicated on the sociological side. We wished to have the major components of the sociologists' notion of "social status" included in our studies but we also wished to have variables which would reflect the idea of "human resources." These concerns lead us to select percentage college educated, median family income, and an occupational index which is basically a ratio of white collar workers to blue collar workers. Appendix A gives the details of these measurements and the sources of the data.

One important lesson we have learned concerning the selection of variables is that in longitudinal research one had

better be careful in the initial selection of variables. Often in the course of the last several years we have wanted to change to other measurements but could not. For example, income per pupil may well be preferable to median family income of families and unrelated individuals. However, the amount of work necessary to go back through three census periods in order to establish this for all our school districts was simply beyond our modest research resources. Similar comments could be made on all the variables used.

The unit of analysis in our studies was the school district with K-12 jurisdiction, with the exception of the Chicago metropolitan area. In Illinois, and especially in the Chicago area, a "dual" district structure (separate high school and elementary jurisdictions, in addition to K-12) prevails. Problems of census translation to elementary districts forced us to use high school districts only. This mixture of units is not good, however, and therefore care should be taken in interpreting the Chicago area results. Different ecological units normally can not be mixed (Cartwright, 1969; Duncan, Cuzzort, and Duncan, 1961). All other things remaining equal, the smaller the geographic or ecological unit, the greater the variance found on almost all school district characteristics. Thus some of the differences in research findings may be a function of the size and number of geographic units used in the analysis. It might also be noted that our school districts are unweighted districts, that is, the district with the smallest

enrollment in the area has an equal opportunity to affect the parameters of the distribution as does the district with the largest student enrollment.

The conversion of social and economic information by census tracts to information by school districts was, beyond a shadow of a doubt, the most laborious part of our investigations. Since the scales of the school district and the census maps are not identical, proportional scales were used to identify the school district boundary on the census maps. Then for those fractional tracts in a particular school district, a transparent paper with 10 x 10 squares to the inch was used to measure the percentage of the fraction to the whole tract. In this manner a conversion code was established to show the number of whole and fractional census tracts present in a school district for each of the three census periods--1950, 1960, and 1970. Despite the care taken by some especially dedicated research assistants, there can be no doubt that some errors crept into these visual approximations. Again, the problem was magnified by having to deal with three census periods. If we were working with only one census period more sophisticated methods, such as aggregating up to school districts from enumeration districts and using fractions of the population count, could have been employed.

The basic notion of "dispersion" of a set of numbers can be expressed by several statistical procedures. Appendix B displays some of these techniques, e.g., the interquartile

variation, the coefficient of variation, a statistical test based on the correlated variances, and several different applications of the Gini Coefficient of concentration and its associated Lorenz curve. Since we are no longer willing to regard these data as samples the "t test" is no longer appropriate. Even if we had not made this change in statistical framework we would still have rejected the procedure based on differences in the simple variance. We would do this because of an inflationary, or more broadly, of a developmental phenomenon in the data. For example, the mean of the distribution of median family income per school district increased in the Boston area from \$3,317 to \$11,583 in the twenty-year period. Simultaneously the mean of the distribution of percentage college educated rose from 11.44 in 1950 to 20.13 in 1970. Similar growth can be recorded on all other measurements used. Therefore, as an inspection of the table presented herein will show, many variables do record a systematic increase in the standard deviation from 1950 to 1970. But we now believe this systematic increase in the standard deviation to be at least partially an artifact of the increasing magnitude of the measurements used; that is, the developmental effect. Put another way, we need to standardize the measurements used at different points in time in order to offset this developmental effect. There are several ways to do this; for example, we might have converted everything to standard scores. However, the coefficient of variation, that is, the standard deviation divided by the mean and

multiplied by 100, is also a method of standardization of distributions with measurements of different magnitude and it has the advantage of being widely used by both economists and school finance analysts. Accordingly we selected the coefficient of variation as our measurement of dispersion for the three points in time. The Gini index would also have offset the developmental effect but, as indicated in appendix B, we prefer to reserve this technique for measuring the concept of fiscal neutrality.

Finally, there are the measurement problems associated with demonstrating increasing determination of local expenditure levels by local resources. Hickrod (1967b) has demonstrated that the determinants of local expenditure level are often related in a curvilinear, not a rectilinear, manner to those expenditure levels. However, the relatively high levels of determination we had already achieved for the 1960 and 1950 census data suggested that a multiple linear regression of the determinants upon the expenditure per pupil would prove satisfactory, at least for this purpose. Accordingly we used a simple forward solution linear regression program to predict expenditures per pupil from assessed valuation per pupil, educational tax rate, percentage college educated, the occupational index, and median family income. Originally we had hoped to cast some light upon the relative predictive power of each of these variables. However, we find such a strong degree of multicollinearity present among our predictors that this

discourages us from trying to comment upon independent prediction powers. Also, as Halinski (1970) has demonstrated, the stability of individual regression parameters is not very great for small "n's" of the type we have been forced to use here.

FINDINGS

Table one gives the data relating to our first hypothesis. Both the standard deviations and the coefficient of variation are indicated for three points in time for the five metropolitan areas. We shall not comment upon the standard deviations, since they are given only to indicate the developmental effect we have previously mentioned. Not much of a trend can be ascertained for the variable, percentage college educated. Two metropolitan areas show increasing inequality--Cleveland and St. Louis--but two others show increasing equality--Chicago and Detroit. The fifth area, Boston, shows little change over the twenty-year period. Median family income is not much help, either. Increasing inequality is, however, demonstrated for three of the areas; Boston, Detroit, and St. Louis. However, increasing equality is present in the case of Chicago and Cleveland. We are thus able to give less support to the notion of increasing income inequality among school districts than we were in our previously reported study of the 1950 decade which relied heavily upon conclusions drawn from the simple variance. It must be observed, however, that the metropolitan area for which we do have the greatest number of

measurements, e.g., the seventy-two school districts in the Boston area, shows a strong trend toward increasing income inequality and much of that movement in the Boston area toward inequality was made in the 1960's, not the 1950's. The occupational index also does not seem to help us much in establishing general trends. In fact, there is some indication in the data that a curvilinear aspect may be present. That is, in Boston and Chicago the inequality rises between 1950 and 1960 and then declines between 1960 and 1970. The overall score on occupational structure is three metropolitan areas with increasing equality and two areas with increasing inequality. In summary, therefore, the hypothesis of increasing residential segregation among school districts is not strongly supported with the single possible exception of the income measurement.

Table two gives the data relating to our second hypothesis. Here, general trends are much more obvious. With regard to expenditures per pupil four metropolitan areas show the same pattern, that is, increasing equality of expenditures. The single exception is the Boston area which shows a movement toward inequality primarily during the decade of the 1960's. We also note that this movement toward expenditure equality in three of the four areas, Chicago, Cleveland, and St. Louis, was greatest during the 1950's, and further movement toward expenditure equality in the 1960's has been minimal. With regard to the wealth of school districts, defined as property valuation per pupil, the trend is very clear; all five

metropolitan areas show a movement toward greater equality. However, we do notice that here too this movement occurred primarily in the 1950's and not the 1960's. St. Louis even shows a curvilinear trend, e.g., increasing equality between 1950 and 1960 and then a slight movement toward inequality from 1960 to 1970. It will come as no surprise that variation in wealth has always been greater among suburban school districts than variation in either expenditures or tax rates. The presence of industrial and commercial enclaves in most metropolitan areas almost assures this phenomenon. Educational tax rates, or educational tax burden or fiscal effort, depending upon how one looks at the matter, also show a movement toward equality in four of the five areas. The exception is Cleveland where there has been little change. Again, in three of these areas the greatest movement toward equality took place in the 1950's although Boston indicates a movement toward equality in the 1960's. In summary, therefore, we are able to provide rather strong support for the Burkhead hypothesis, including the crucial variable of property valuation per pupil. There is some indication in the data, however, that this movement toward equality may have been more a phenomenon of the 1950's than of the 1960's. Like most of us, Burkhead's hindsight may have been greater than his foresight.

Table three gives the data relating to our third hypothesis and again provides us with strong support for the initial hypothesis. In every metropolitan area studied the

multiple R squared or coefficient of determination, as it is sometimes called, rises between 1950 and 1970. There is some fluctuation with both Chicago and Detroit dropping and then rising again, but there is little question that expenditure levels were more determined by local resources in 1970 than they had been in 1950. This phenomenon may also, however, be more a matter of hindsight than of foresight. It is difficult to conceive of better prediction power than the 80 to 90 per cent levels registered for all areas except Chicago. The fluctuations of the data for Chicago and Detroit do alert us again, however, to Halinski's warning (1970) concerning parameters derived from small sets of numbers in regression analysis.

CONCLUSIONS

The customary ending to such a paper as this is to plead for more research in the same vein. We are not at all sure that we want to do this. Some of the problems mentioned here can, of course, be overcome. For example, the choice of measurement technique for dispersion, while troublesome, is not insoluble. It may take something just short of physical coercion to get certain researchers to drop their own pet measurement techniques, but it can be done. The problem of defining "suburbia," however, is much more difficult; in fact, it may be unsolvable. One is dealing here with a growth phenomenon and the whole concept of growth is not well handled by

conventional statistical procedures. It is possible to argue, for example, that not only are these not samples, they may not even be the same populations, that is, that comparing the measurements of a suburban population of 1970 with its own measurements in 1950 is rather like comparing the measurements of a man, now, with his own measurements as a boy some twenty years earlier.

Our real concern, however, is that our results do not seem to feed into any public policy or administrative decision. This problem springs from the fact that, whether we like it or not, educational administrative decisions are seldom taken in terms of metropolitan areas. They are taken either for single school districts or for the state as a whole. Fortunately, our work can serve at least as a partial model for socio-economic disparity analysis conducted on the state level. In fact, there is already a body of literature using the state, rather than the metropolitan area, as the areal focus to which our results can already be related. Let us take simple expenditure per pupil as an example. Harrison and McLoone (1965), Bendixsen (1972), Hickrod and Chaudhari (1973), and Benson and Others (1965) have all conducted longitudinal analyses of expenditure variation at the state level. While there are many qualifications and exceptions, it does seem that there has been a movement toward equality of expenditures among school districts within states and this trend may go back as far as 1940. This trend varies from state to state, from decade to decade,

and at least in some states, from one type of school district to another. Longitudinal evidence of a similar nature for property valuations per pupil and for tax rates seems somewhat harder to find. In our view all state departments of education, and certainly the USOE, should be encouraged to expand these longitudinal or "trend" fiscal examinations of each state.

Doing state-wide studies on the human resource side will prove more difficult than on the fiscal side. This is true because there exists no well established mechanism for collecting school district human resource data comparable to the mechanisms for collecting more conventional fiscal data. However, it appears to us that a start has been made in this direction with the USOE's project for converting 1970 census data to school district terms (Dorfman, 1973). For the immediate future these 1970 USOE census data will have to be used in cross-sectional studies only. However, it may be possible to go back and assemble a set of similar data for 1960, and it certainly is possible to lay plans now for trend studies using the 1980 census data when that is available. Of course state-wide studies and certainly national studies are much more expensive to do than the limited scope metropolitan studies we have been engaged in. But if we do not do these studies then we can do little to plan for the future. The current concern with futurology in educational administration is certainly laudable, but it is a little difficult to know where you are

going if you don't know where you have been.

Finally the broader policy implications of our efforts are both encouraging and discouraging. Educational administrators will probably view as encouraging the reported movement toward equality in property valuations, tax rates and expenditures. This may well herald a new period of cooperation within metropolitan areas since the old fiscal disparities certainly operated to keep districts apart. If the rich have less to lose, and the poor less to gain, cooperation is much more likely. Since the authors count themselves among those who favor the goal of fiscal neutrality we are discouraged, however, with the results indicated in table three. If additional research confirms that we have been moving progressively away from fiscal neutrality for twenty years, then it will take massive state legislative action to change this trend. Some favorable state supreme court decisions would certainly help here. On this last point, therefore, it is indeed our wish that further research be done on this matter of whether we are moving toward, or away from, fiscal neutrality. These new studies, conducted on a state-wide and national level, may hopefully prove groundless the anxieties which have now arisen from our efforts at the metropolitan level.

TABLE ONE: HUMAN RESOURCE INEQUALITIES
AMONG SUBURBAN SCHOOLS

SMSA	<u>Percentage College Educated</u>					
	<u>Standard Deviation</u>			<u>Coefficient of Variation</u>		
	1950	1960	1970	1950	1960	1970
Boston	6.73	8.80	11.82	58.84	58.91	58.74
Chicago	7.48	8.50	11.49	68.04	61.77	62.65
Cleveland	6.47	7.54	10.48	57.83	59.96	65.38
Detroit	5.22	6.08	7.36	96.30	78.53	88.76
St. Louis	6.14	7.56	9.26	78.69	87.07	81.92

SMSA	<u>Median Family Income</u>					
	<u>Standard Deviation</u>			<u>Coefficient of Variation</u>		
	1950	1960	1970	1950	1960	1970
Boston	487	1092	2768	14.68	16.10	23.89
Chicago	797	1384	2420	19.11	17.41	18.90
Cleveland	842	1603	2093	19.24	19.91	16.83
Detroit	616	1279	2323	15.44	17.87	19.50
St. Louis	785	1647	2246	23.61	26.79	24.65

TABLE ONE: Continued

SMSA	<u>Occupational Index</u>			<u>Coefficient of Variation</u>		
	<u>Standard Deviation</u>					
	1950	1960	1970	1950	1960	1970
Boston	0.67	1.06	1.83	73.01	82.03	80.67
Chicago	0.98	1.29	1.65	91.45	102.67	87.30
Cleveland	1.18	1.22	1.61	112.08	106.78	90.42
Detroit	0.58	0.73	0.85	141.53	121.56	111.03
St. Louis	0.85	1.25	1.99	100.00	124.16	138.60

Note: The coefficient of variation is the standard deviation, divided by the mean, and multiplied by 100.

TABLE TWO: FISCAL INEQUALITIES AMONG
SUBURBAN SCHOOLS

SMSA	<u>Current Operating Expenditure Per Pupil</u>					
	<u>Standard Deviation</u>			<u>Coefficient of Variation</u>		
	1950	1960	1970	1950	1960	1970
Boston	38.46	59.41	172.14	18.45	17.00	26.61
Chicago	410.35	154.93	234.24	67.13	21.28	16.82
Cleveland	91.16	122.05	196.28	43.31	23.77	22.49
Detroit	81.17	149.66	75.36	34.97	29.06	12.35
St. Louis	100.93	189.44	253.33	37.53	30.59	29.02

SMSA	<u>Assessed Valuations Per Pupil</u>					
	<u>Standard Deviation</u>			<u>Coefficient of Variation</u>		
	1950	1960	1970	1950	1960	1970
Boston	9529	9629	8089	44.03	32.28	32.93
Chicago	62854	27515	17416	69.00	37.63	23.48
Cleveland	19613	23701	26824	135.70	111.80	106.70
Detroit	6223	9099	9587	68.78	62.38	53.92
St. Louis	12711	9924	11064	125.67	62.80	66.89

TABLE TWO: Continued

SMSA	<u>Educational Tax Rates</u>					
	Standard Deviation			Coefficient of Variation		
	1950	1960	1970	1950	1960	1970
Boston	1.98	2.56	5.81	23.48	24.42	17.89
Chicago	1.40	1.53	2.52	25.88	17.91	19.83
Cleveland	3.00	4.84	6.93	19.25	20.19	20.81
Detroit	3.06	3.79	4.65	33.15	23.08	17.00
St. Louis	0.64	0.67	1.01	29.59	23.39	24.59

Note: The coefficient of variation is the standard deviation, divided by the mean, and multiplied by 100.

TABLE THREE: DETERMINATION OF CURRENT OPERATING
EXPENDITURE BY LOCAL SCHOOL
DISTRICT CHARACTERISTICS

SMSA	Coefficient of Determination (R^2)			N
	1950	1960	1970	
Boston	.769	.823	.896	72
Chicago	.636	.346	.679	28
Cleveland	.482	.710	.823	29
Detroit	.796	.673	.936	23
St. Louis	.395	.838	.939	23

Note: The dependent variable is current operating expenditure per pupil; the independent variables are assessed valuation per pupil, educational tax rate, percentage college educated, median family income, and the occupational index.

APPENDIX A: DETAILS ON VARIABLES
USED IN THE STUDY

Expenditure Per Pupil:

This is based upon current operating expenditures per pupil in either average daily attendance or net average membership depending upon the particular state. Capital expenditures are not included. In Illinois, these are expenditures as reported in their so-called "educational fund." The expenditures include state funds and are not expenditures raised solely from local tax sources.

Assessed Property Valuations Per Pupil:

In all cases this is based upon state adjusted property valuation figures and includes in an undifferentiated form residential, commercial, and industrial valuations. The ratio of assessed to "real" value varies from state to state but this poses a problem only in the St. Louis data.

Tax Rate for Education:

With the exception of Illinois this is the rate levied for total support of the schools. It is the legal rate except in Massachusetts where a substitute value was used. In Illinois it is the rate levied in their so-called "educational fund." Each state expresses the rate differently, i.e., mills, dollars on the hundred, thousand, etc., and therefore the data should not be pooled.

Percentage College Educated:

Based on the proportion of persons 25 years old and over with four years or more of college education.

Median Family Income:

This is the median income for families and unrelated individuals and not for families alone. Comparability with the 1950 census mandated this measurement.

Occupational Index:

This is based upon the ratio of the proportion of "professional" plus "managerial" to the proportion of "craftsmen" plus "operatives" in a particular school district. See the Federal Census of Population for detailed definitions of these occupational categories.

Sources of Data:

Data on the first three variables was supplied directly by the State Departments of Education in Illinois, Massachusetts, Michigan, Missouri, and Ohio. Data on the last three variables was obtained from the following census documents: From the 1950 Census: Bulletins P-D 47, 10, 06, 12, 17. From the 1960 Census: Final Reports PHC (1) 131, 026, 018, 028, 040. From the 1970 Census: Final Reports PHC (1) 045, 058, 181, 029, 043.

APPENDIX B: SELECTED STATISTICS FOR THE MEASUREMENT
OF DISPARITY AND INEQUALITY
AMONG SCHOOL DISTRICTS

- I. The three most common statistical techniques for the measurement of inequality among school districts would seem to be the interquartile variation, the coefficient of variation, and a statistical test based upon the correlated variances. The formulas and the literature in which they have been used are indicated below.

- a. The interquartile variation:

$$V = \frac{Q_3 - Q_1}{Q_1 + Q_3} \quad (\text{Mattila and Thompson, 1968; Murray, 1969})$$

$$V = \frac{Q_3 - Q_1}{Q_1 + Q_3} \times 100 \quad (\text{Curran, 1963})$$

$$V = \frac{Q_3 - Q_1}{Q_2} \quad (\text{Burkhead, 1961; Liebman et al., 1963})$$

- b. The coefficient of variation:

$$V = \frac{\text{standard deviation}}{\text{mean}} \quad (\text{Mattila and Thompson, 1968})$$

$$V = \frac{\text{standard deviation}}{\text{mean}} \times 100 \quad (\text{James et al., 1961, 1963; Benson and Others, 1965})$$

- c. The T test based on correlated variances:

$$T = \frac{(s_2^2 - s_1^2) \sqrt{N - 2}}{\sqrt{4s_1^2 s_2^2 (1 - r_{12}^2)}}$$

where:

S_2^2 = the variance at the second point in time

S_1^2 = the variance at the first point in time

R_{12}^2 = the square of the correlation of the two sets of measurements

(Hickrod and Sabulao, 1969a, 1969b;
Lows et al., 1970)

- II. The Gini coefficient of concentration and its associated Lorenz curve has also been used to measure disparity among metropolitan units of government. There are several different computational forms used. Three are given below.

- a. The cross-multiplication of cumulated proportions:

$$G = \sum X_{j-1} Y_j - \sum X_j Y_{j-1}$$

where:

X = cumulated proportion of the school district characteristic through the jth interval

Y = corresponding proportion of school districts through the jth interval

j = an equal interval on the school district characteristic scale

(Hickrod, 1967a)

- b. The original formula:

$$G = \frac{\text{Mean Difference}}{2 \times \text{Mean}}$$

(Boelaert, 1970)

c. Another cumulated proportion system:

$$G = 0.5 - \sum A_1$$

$$A_1 = F_1 \sum Y_n + \frac{Y_1}{2}$$

where:

F_1 = incremental percentage of families

Y_1 = incremental percentage of income

$\sum Y_n$ = sum of previous income increments

(Murray, 1970; 1971)

III. A specific and very useful application of the Gini coefficient of concentration is in the measurement of the concept of "fiscal neutrality," sometimes called "the Serrano principle." The application is as follows:

$$G = \sum X_{j-1} Y_j - \sum X_j Y_{j-1}$$

where:

X_j = cumulative proportion of ADA for the j th interval where districts have been previously ranked by some measurement of wealth (usually property valuations per pupil)

Y_j = cumulative proportion of current operating expenditures per pupil for the j th interval

j = an equal interval on the wealth scale

Note: Plotting the two cumulative proportions (pupils ranked by wealth and expenditures per pupil, against one another results in a Lorenz curve. The extent to which this curve departs from a straight line is a graphic demonstration of the degree of "fiscal neutrality."

(Hickrod, Chaudhari, and Tchong, 1972; Hickrod and Chaudhari, 1973; Hickrod, 1973)

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